

A new species of the genus *Baculofractum*, the first record of the genus from Borneo.

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Abstract

The genus *Baculofractum* Zompro, 1995, was based on a single species, *Carausius insignis* Brunner, 1907, from Sumatra. A new species is described from Borneo. The new species is one of the longest members of the Necroschiinae and is based on six specimens, including both sexes and eggs, which have been collected over a period of more than 100 years.

Key words

Phasmida, Phasmatodea, Necroschiinae. *Baculofractum shelfordi* n.sp., Borneo.

Introduction

The genus *Baculofractum* Zompro, 1995 was previously monotypic and known only from Sumatra; a new species has been found in Borneo. The type material of the new species, which includes both sexes and eggs, is contained in four collections and has been collected over a period of more than 100 years. The new species has a wide distribution within Borneo. The female is one of the longest insects currently placed in the Necroschiinae. Unlike the type species, there is a considerable difference in the length of the two sexes.

Baculofractum Zompro, 1995

Type species *Carausius insignis* Brunner, 1907, by original designation.

Brunner described his species in the genus *Carausius* Stål, 1875, a genus to which the female has a strong resemblance. *Baculofractum* may be distinguished from *Carausius* by the more slender legs in the female, by the presence of wings in the male, and by the lack of a capitulum on the egg.

When I collected a nymph of the new species in 1993, I also provisionally assigned it to *Carausius*, but chose not to describe it in my treatment of the Bornean Lonchodinae (Bragg, 2001: 415). With the discovery of specimens in the collection of the Forestry Research Centre, at Sepilok in Sabah (FRCS), it became clear that these specimens belong in Necroschiinae. Although the new species lacks a deep operculum, one of the diagnostic features of the genus, it is best placed in *Baculofractum* at present.

The females of the new species can be readily distinguished from *Baculofractum insignis* by its shape (*insignis* females are relatively fat), and by the flat operculum. Males are distinguished by absence of elytra. The female has a carina expanded into a lamina on the fore femora, but not as pronounced as in *B. insignis*: a small lamina is present in males of both species, but again it is larger in *insignis*.

Baculofractum shelfordi n.sp.

Material

Holotype: ♀ and eggs (FRCS) Sabah, Imbak valley, base camp, 13-07-2000, Dr Arthur, Momin & Richard.

Paratypes: ♂ (FRCS) Sabah, Imbak valley, base camp, 13-07-2000, Dr Arthur, Momin & Richard; ♀ & 1 egg (FRCS) Sabah, Telupid, H.S. Tawai, Jun-julai [19]94, Ento: Staff; ♀ (CUMZ) Sarawak, May 1892; ♀ nymph (PEB-2000) Kalimantan Tengah, Palangkaraya. Found by Timbang Effendy, 03.09.1993; ♀ nymph (SMSM-240) Simanggang, May 28th 1909

[or '99 - see note below].

Notes on material

FRCS: H.S. Tawai (H.S. = Hutan Simpan) is Tawai Forest Reserve, N005° 39' E117° 13'. The specimen from Tawai was collected in June-July 1994 by members of the FRCS Entomology Department.

The Imbak valley base camp was at N005° 06' 23" E117° 015' 51, adjacent to the Imbak waterfall. The elevation of the camp was 200-250m. The vegetation of the area is of riverine dipterocarp forest dominated by *Dryobalanops beccarii* Dyer or 'kapur merah'. The collectors were Dr A.Y.C. Chung, Momin Binti, and Richard L. Ansis.

SMSM-240: Simanggang is now known as Bandar Sri Aman, N001°10' E111°27'. The date is hand written and the year appears to read 1909, however the one and zero are so small the year could be '99 (for 1899). Like many of the SMSM collection, the specimen has suffered from being kept in humid conditions until the relatively recent use of air conditioning in the museum; consequently it is in poor condition.

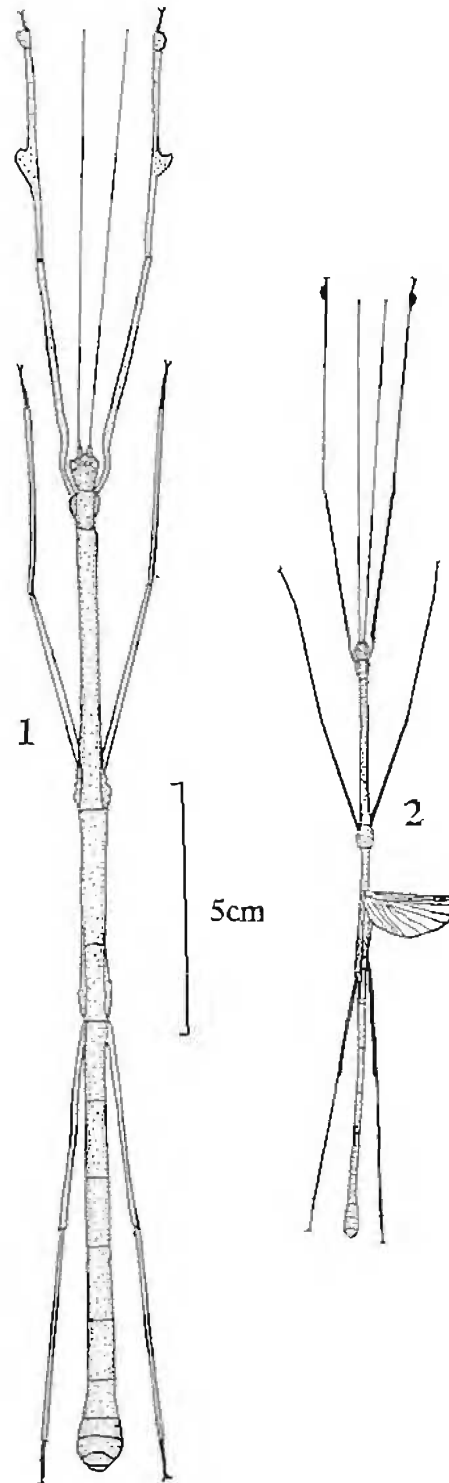
PEB-2000: The specimen was kindly given to me by Timbang Effendi who found it near his house during my collecting trip in 1993.

Adult female (figs. 1, 3-7)

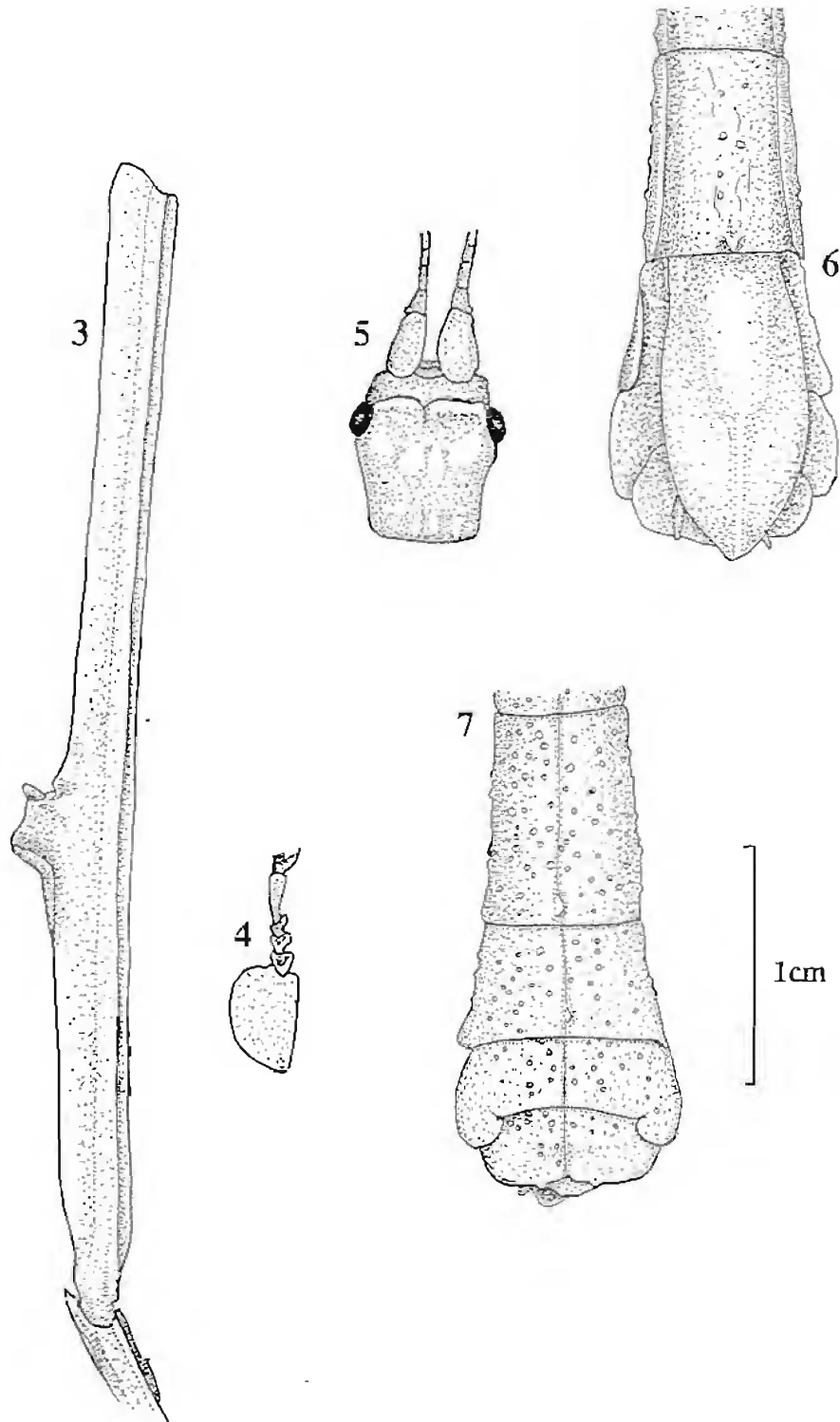
Almost uniformly mid brown, but with apices of tubercles darker brown. Body long and slender, uniformly covered with prominent granules or small tubercles, except for the head and pronotum. Completely wingless. Fore tibiae strikingly lobed.

Head longer than wide, narrowing at the rear; with two transverse lobes between the eyes, and four tubercles forming a semicircular ridge on the top of the head (fig 5). Antennae almost as long as the fore legs; basal segments very flattened and broadened; second segment short, the base with a small blunt tubercle on the outer margin; remainder indistinctly segmented, segmentation becoming clearer near the apex.

Pronotum almost twice as long as wide, almost rectangular, lacking granules or



Figures 1-2. *Baculofractum shelfordi* n.sp.
1. Female holotype. 2. Male.



Figures 3-7. *Baculofracum shelfordi* Holotype female.

3. Left fore tibia. 4. Fore tarsus. 5. Head. 6-7. Apex of abdomen, ventral and dorsal views.

tubercules, with a few indentations. Mesonotum very long, about twelve times longer than width of mid point, widening gradually towards the posterior; uniformly finely tuberculate, with a fine longitudinal carina, and with a slightly raised swelling on the posterior margin. Metanotum half as long as the mesonotum, but of similar width. Median segment about three

fifths of the length of the mesonotum, narrower, with the metapleura clearly visible dorsally. Meso and metapleura tuberculate. Mesosternum with longitudinal carina, otherwise smooth. Metasternum tuberculate.

Abdominal segments 1-6 of similar length, and roughly three times longer than wide. Segments 7-9 widening considerably, 9th almost twice as wide as 1-6. Segment 7 only slightly more than half as long as 6th; 8th only slightly more than half the length of 7th; 9-10 of similar length to 8th. Apex of 10th almost straight, with only very slight serrations. Lamina supraanalis very small, rounded. Abdominal sternites 2-7 tuberculate. Operculum about twice as long as wide, almost flat except at centre of the basal half (fig 6). Cerci small, more or less hidden dorsally, blunt, flattened.

All legs with the femur and tibia of almost equal length. All legs with dorso-anterior carina of femur rotated into a ventral position and then the femur and tibia are laterally compressed. Femora and tibiae of mid and hind legs lacking any major lobes or spines; fore tibiae strikingly lobed.

Fore femora basally compressed; dorso-posterior carina expanded into a serrated lamina beyond the base; ventro-posterior carina with a lobe near the apex bearing three small spines, the apex of the carina projects forwards over the joint as a spine-like lobe. Apex of both posterior carinae with spine-like lobes projecting over the femoral-tibial joint. Fore tibiae with a large dorsal lamina which is expanded as a lobe just before the mid point (fig 3). Fore tarsi with large lobe on the basal tarsomere (fig 4), first tarsomere longer than 2-4 combined, almost as long as 2-5.

Mid femur with a minute spine near the apex of the ventro-posterior carina. Mid tarsus with basal tarsomere about equal length as 2-4 combined.

Hind legs reaching just beyond the apex of the abdomen. Ventro-posterior carina of hind femur with two or three minute spines near the apex. Hind leg with basal tarsomere about 1.5 times longer than combined length of 2-4.

Both adult paratypes are more tuberculate than the holotype; the CUMZ specimen in particular has large rounded tubercles on the mesonotum and metanotum. The FRCS paratype has right fore and right mid legs missing; the CUMZ specimens has all its legs but the pro and mesothorax have been quite badly damaged by pests, the head is held on by a pin. The lengths are as follows: holotype 200mm, FRCS paratype 169mm, CUMZ paratype 172mm; full measurements of the holotype are given in table 1.

Table 1. <i>Baculofractum shelfordi</i> n.sp., measurements in mm				♀ HT	♂
	♀ HT	♂	Fore femur	46	33
Total length	200	119	Fore tibia	46	36
Antennae	85	68	Fore tarsus	9	6
Head	6.5	3	Mid femur	39	24
Pronotum	7	4	Mid tibia	35	26
Mesonotum	53	32	Mid tarsus	8.5	6
Metanotum	25	10.5	Hind femur	45	25
Median segment	15	10	Hind tibia	46	31
Hind wing	-	18	Hind tarsus	10	6

Adult male (figs 2, 8-9)

Whole insect appears uniformly mid brown, although under magnification dark streaks can be seen; the anal region of the wing is translucent light brown. Body and legs long and slender, body with a few large granules or small tubercles becoming more dense towards the apex of the abdomen. Hind wings short, no elytra. Fore tibiae without lobes, basal tarsomere clearly lobed. The specimen has had the right fore leg glued back on, resulting in quite a quantity of glue on the head.

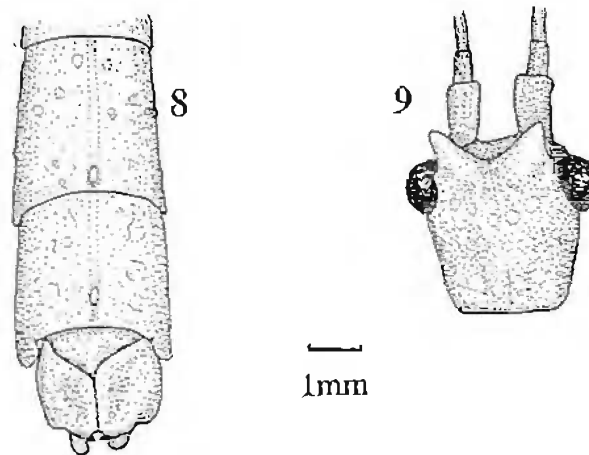
Head longer than wide, narrowing at the rear. With a pair of spines between the eyes (fig 9), and four tubercles on the back of the head. Antennae almost as long as the fore legs; basal segment flattened and broadened; second segment short, the base with a small blunt tubercle on the outer margin; remainder indistinctly segmented, segmentation becoming clearer near the apex.

Pronotum one and a half times longer than wide, almost rectangular, lacking granules or tubercles, with a few indentations. Mesonotum very long, about twenty times longer than width of mid point (1.4mm), widened slightly at anterior and posterior; very sparsely finely tuberculate towards the lateral margins. Elytra are completely absent, but in the position normally associated with the musculature of elytra in other phasmids there is a pair of indentations that suggest the musculature may be present. Metanotum and median

segment each about one third of the length of the mesonotum. Metanotum sparsely finely tuberculate on lateral margins, median segment without tubercles. Dorsally the mesopleura are clearly visible at the point of attachment of the legs, the metapleura are clearly visible along the whole length of the median segment. Meso and metapleura tuberculate. Mesosternum with longitudinal carina, otherwise smooth. Metasternum tuberculate. Wings reaching to mid point of second abdominal segment.

Second abdominal tergite smooth, third very indistinctly tuberculate, remainder becoming increasingly tuberculate; eighth and ninth with small dorsal lobes on posterior margin. Abdominal segments 1-5 of similar length, 6th slightly shorter, 7th notably shorter (5.5mm) and widening slightly at the posterior; 8th and 9th shorter (c. 3mm) considerably widened, about as wide as long; 10th wider than long, with a distinct longitudinal carina. Apex of 10th with a pair of hooks. Abdominal sternites rugulose. Cerci extremely flattened, ends blunt. Poculum flattened, with a longitudinal carina.

Legs all long and slender, tibiae slightly longer than femora; femora and tibiae all laterally flattened with carinae similar to those of the female although the lamella on the fore femur is almost insignificant. Dorsal surface of fore tibia with a lamella about as high as the tibia, expanding slightly towards the apex, but without the large lobe found in the female. Fore femora with a dorsal spine-like lobe projecting over the femoral-tibial joint, mid and



Figures 8 & 9. *Baulofractum shelfordi* n.sp. male.

8. Apex of abdomen, dorsal view.

9. Head, dorsal view.

hind legs without such a lobe. Ventro-posterior carinae of all femora with a two small spines near the apex. Hind legs reaching just beyond the apex of the abdomen. Fore tarsi with large lobe on the basal tarsomere, the lobe is about three times the height of the tarsus and larger than the lamella of the tibia. Fore and hind tarsi with basal tarsomere about half the total length. Mid tarsus with basal tarsomere about two-fifths of the total length.

Female nymphs

The distinctive lobes on the fore tibiae of the adult female are clearly present in the two nymphs.

SMSM-240: length 90mm. Left hind leg missing, three legs repaired, left fore and right hind with tarsi missing. Whole insect almost uniformly dark brown. Second abdominal tergite with posterior lobe.

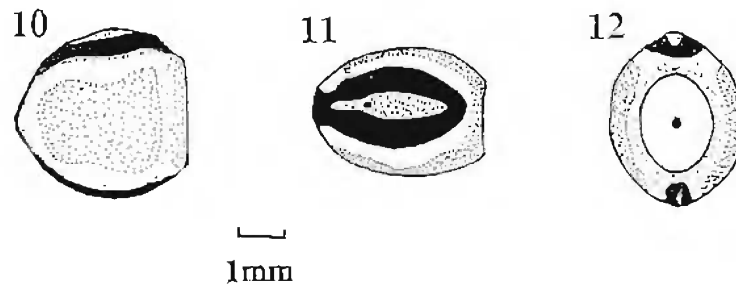
PEB-2000 length 127mm. Left fore leg missing. Whole insect greyish-brown, abdominal segments 2-5 discoloured (darkened) during preservation. Second abdominal tergite with posterior lobe.

Eggs

Seven eggs are associated with the holotype; five have clearly been removed from the body post mortem, this is probably also true for the other two since all have an almost smooth surface. The following description is based on the two most strongly coloured eggs.

Capsule mid brown, with a broad black line circling the egg along the dorsal, polar and ventral edges, and with fine black mottling on the lateral surfaces; the micropylar plate is mid brown; the operculum is black. Capsule a laterally compressed sphere, slightly pointed at the polar end and with a flat opercular end. The operculum is oval, with a central depression. Micropylar plate a slightly raised band running most of the length of the dorsal surface. Capsule length 3.6mm, height 3.5mm, width 2.7mm; operculum width 1.3mm, height 1.8mm.

The FRCS paratype female has one egg associated with it (figs 10-12). This egg lacks the operculum (but has not hatched, contents are still present), but has a sculptured surface and more distinct colouring than the eggs from the holotype; in figure 12 a black dot marks the position of the opercular depression, determined by reference to the eggs from the



Figures 10-12. Egg of *Baculofractum shelfordi* n.sp.
10. lateral view. 11. dorsal view, 12. opercular view.

holotype female. The capsule is uniformly rugulose; the pattern of black lines is the same as on eggs from the holotype, but the lateral surfaces are dark brown and there is a pale brown, almost cream, coloured band between the black bands and the brown lateral patches. Although the paratype is 15% shorter than the holotype, and correspondingly thinner, the egg is almost identical in size: length 3.6mm, height 3.4mm, width 2.7mm.

Etymology

This new species is named after Robert W.C. Shelford, Curator of the Sarawak Museum from 1897 to 1905. Although better known for his extensive work on cockroaches, Shelford

is responsible for the majority of the museum's phasmid collection, and also for much of the general insect collection, very few specimens have been added since Shelford's departure. In addition to material remaining in the Sarawak Museum, a significant number of specimens from Shelford's collection went to Cambridge and Oxford universities when he returned to England. The Sarawak Museum (SMSM) and Cambridge University Museum of Zoology (CUMZ) each contain one specimen of the new species.

Comments

The length of the adult female is such that it is unlikely to be mistaken for any other described Bornean species. The only other insects of this length are members of the Phasmatinae which all have antennae shorter than their fore femora. The male is similar in general appearance to *Lopaphus borneensis* Bragg, 1995 but is about twice as large and has the prominent lobes on the fore tarsi. Although this species does not appear to be common, it does have a wide distribution, occurring in central Kalimantan, western Sarawak, and in Sabah (fig 13).



Acknowledgements

I am grateful to staff at SMSM, CUMZ, and FRCS for the loan of specimens, and to Dr Arthur Chung for providing me with additional information on the locality of the holotype.

Figure 13.

Distribution map for *Baculofractum shelfordi* n.sp.

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